System Inspector Manual
Appendix
Inspection and Guidance

Guidance for the inspection of On-site Sewage Disposal Systems

On-site sewage disposal systems are governed by Title 5 of the State Environmental Code 310 CMR 15.000. Experience has shown that when properly designed and sited, these systems provide an acceptable level of wastewater treatment and are a legitimate treatment and disposal option in areas where centralized sewers are not available. However, given the traditional view that these systems are temporary solutions until sewers are provided, they are often neglected and this can result in harm to the environment and threats to the public health. In order to address this problem and correct the prevailing attitude toward on-site systems, Title 5 requires that systems be inspected under certain circumstances. In this manner, system owners can be educated about the importance of properly maintaining their systems, and those systems that are an environmental or public health threat can be identified and upgraded.

This document is intended to provide guidance to both the system owner and the system inspector for evaluating the adequacy of existing on-site sewage disposal systems. Approved System Inspectors are charged with the responsibility of inspecting systems in accordance with 310 CMR 15.302,15.303 and this guidance and reporting their findings to the approving authority.

The goal of the inspection is to provide sufficient information to make a determination as to whether or not the system is adequate to protect public health and the environment. If conditions exists that show the system is failing to protect public health or the environment, the system must be repaired, replaced or upgraded. The **only grounds** for failing a system or conditionally passing a system are if any of the criteria listed on the inspection form and specified in10 CMR 15.303 are met.

The inspection must avoid disruption of the functioning of the system and should be conducted to minimize disruption of the site in general. However, at a minimum, all manholes, covers, and cleanouts must be exposed .in order to achieve the goal of this inspection. Pumping of system components, when required, shall be done after an initial inspection of the entire disposal system to observe normal operating conditions. Each component requiring pumping can then be re-inspected after pumping has been completed.

The Department has developed an approved System Inspection Form that is to be completed by the Inspector when doing an evaluation. The form consists of:

Part A – Certification
Part B – Checklist
Part C – System Information

The form can be downloaded at:
http://www.state.ma.us/dep/brp/wwm/t5forms.htm

Part A certification

The Certification Section has two principal functions. First, it provides identification information on the property being inspected and the inspector. Second it presents the results of the inspection relative to the failure criteria outlined in 310 CMR 15.303. In the certification statement, the inspector is certifying that the conditions existing at the time of inspection are accurately presented in the inspection report. The inspector is not certifying that the system is adequate for the current use of the system nor for the future use of the system.

In the Inspection Summary portion of Part A, the inspector indicates whether the system passed inspection, conditionally passed inspection, failed inspection, or needs further evaluation by the Local Approving Authority. Usually the local Board of Health is the Local Approving Authority. For systems with a design flow of10,OOO gallons per day or greater or for state owned and federal facilities, the Department is the Local Approving Authority.

System passes

None of the failure criteria listed in 310 CMR 15.303 are violated.

System Conditionally Passes

The system violates one of the failure criteria in 310 CMR 15. 303 but the nature of the violation is such that it can be easily corrected by making a simple repair or replacement to the broken component. In many cases this can be done without needing to get a Disposal System Construction Permit from the Board of Health. The Board of Health or agent should be consulted before any corrections are made, even if a permit will not be required.

Further Evaluation is Required by the Board of Health

There are a number of situations where the inspector will not be able to determine if the system passes or fails. They are listed on the form under the section, "Further Evaluation is required by the Board of Health." The first two situations involve cesspools or privies located within 50 feet of a surface water body (not a drinking water supply or its tributaries) or a bordering vegetated wetland or salt marsh. These systems will pass inspection unless the Board of Health determines that a cesspool or privy is functioning in a manner that does not protect the public health and safety and the environment. This determination must be made by the Board of Health. System inspectors can NOT make this evaluation. The system inspector should merely identify that the cesspool or privy is located within the setback. Boards of Health will use other information collected by the inspector, such as depth to ground water, system design and flow characteristics, along with specific guidance prepared by the Department to help with that determination.

A second set of situations involve septic tank and soil absorption systems that are too close to drinking water supplies, drinking water supply tributaries, public and private water supply wells. In these situations, the systems are deemed to be failed unless the Board of Health (in conjunction with the public water supplier in the case of public surface water supplies and their tributaries) determines that the systems are

functioning in a manner that protects the public health and safety and the environment. Again, the system inspector can NOT make this evaluation. The information collected during the inspection and the guidance provided by the Department will be used by the Board of Health to make the determination. The system inspector can assist the Board of Health in the case of septic tanks and soil absorption systems located less than 100 feet from a private drinking water well by arranging to have the well tested for coliform bacteria, volatile organic compounds and ammonia and nitrate nitrogen.

System fails

The system fails if any of the criteria listed in 310 CMR 15.303 (1) (a) through (c) are violated. If the system fails, the owner or operator of the system should contact the Board of Health before any attempt is made to upgrade or repair the system or otherwise attempt to bring the system into compliance. In virtually every situation, a permit will be needed from the Board of Health. It only makes sense, therefore, to contact the Board of Health to determine what the Board will require before arranging to have plans drawn, etc.

Large Systems

In addition to the criteria that apply to all Title 5 regulated systems there are several criteria that apply to systems with a design flow of 10,000 gallons per day or greater. If the large system is located within 400 feet of a surface drinking water supply, 200 feet of a tributary to a surface drinking water supply or within a nitrogen sensitive area, Interim Wellhead Protection Area (IWPA) or a mapped Zone II of a public water supply well, the system is failed. In this instance, the owner/operator of the system will be required to obtain a ground water discharge permit from the Department. The owner/operator should contact the local regional office of the Department to determine what must be done.

The completed System Inspection Form must be submitted to the approving authority within 30 day's by the approved System Inspector. The regulations 310 CMR 15.301(10) provide the owner of a system the ability to have their system assessed without having a complete inspection. Such an assessment need not be done by an approved inspector and the Official Inspection Form is not used. It can NOT be used to satisfy the requirements to have a system inspected as required in 310 CMR 15.301. Finally, the results of a voluntary assessment not performed to comply with the requirements of section 310 CMR 15.301 need not be submitted to the Local Approving Authority.

Minimum Requirements for an Inspection

The following are the minimum requirements necessary to complete an inspection. Meeting these minimum criteria, however, should not be construed as completion of an acceptable inspection if through reasonable effort, a complete inspection of all components of the system is feasible. Furthermore, if a complete inspection cannot be performed, the inspector must provide adequate documentation of the specific conditions that prevented a complete inspection and should indicate on the inspection form what was done to try to locate components, determine high groundwater, etc.

1. The inspector must note the general conditions of the property to identify any obvious signs of failure. These would include but not be limited to backup of sewage to the facility, effluent ponding, breakout to the surface of the ground or to surface waters, and other occurrences which professional judgment would deem indications of failure.

2. All components prior to the leaching facility must be located and inspected. In a conventional component system, this would generally require inspection of the septic tank and distribution box. If a cesspool system, all cesspools in the system must be exposed for inspection.

3. Determine high groundwater elevation at the site.

Preliminary Activities

Information on system pumping must be requested of the owner, occupant, Board of Health or septage receiving facility**.**

Inspections of on-site systems should begin with a records search at the local Board of Health or other appropriate sources to obtain design plans and as-built drawings, if available. This information will facilitate locating the system components in the field. If these records are not available, then the components will have to be located by other means. Non-invasive techniques for locating system components such as the use of metal detectors or estimating length and direction of pipes are preferred options. However, as a last resort, it may be necessary to expose piping at intervals in order to trace out the layout of the system.

Inspection Procedure

General

Walk around the entire site to note general conditions and check for obvious signs of failure such as surface breakout or ponding. Look for signs of sewage, stains on the ground or saturated, spongy soils. The presence of sewage odors must be determined when first arriving at the site.

Check pumping records for frequency .of system pumping and verify that the system has not been pumped within two weeks prior to inspection.

Interview occupants concerning back-up or break-out or high groundwater. Sewage backup into the house can be caused by:

1. clogged pipes
2. surcharged septic tank
3. failed leaching area

It is extremely important that the inspector determine the cause of the backup or breakout. For example, if the problem is due solely to broken or obstructed pipes, this would be considered, a Conditional Pass situation; however, if the cause of the backup or breakout can be attributed to a general clogging of the leaching system by solids, then this could be grounds for failing the system.

Locate and inspect all pipes exiting the building.

Septic Tank

Expose and remove manhole covers. If septic covers are more than a foot deep, recommend that extensions be provided to within six (6) inches of finished grade.

Determine material of construction. If the tank is a metal tank this is grounds for a conditional pass providing that no other conditions exist that would trigger a system failure. Unless the owner or operator has provided the system inspector with a copy of a Certificate of Compliance indicating that the tank was installed within the 20 year period prior to the date of inspection.

Check inlet and outlet tees or baffles for damage. Recommend repair necessary based on the requirements of 319 CMR 15.227.

Check liquid levels for evidence of leakage. If tank is discharging when there is no flow from facility there may be infiltration to the tank which would indicate that the tank may be in high groundwater and is not watertight. If the liquid level is below the outlet invert then the tank is probably leaking to surrounding soils. Leaking tanks must be pumped in order to inspect them further. If further inspection shows that the tank is cracked, structurally unsound, is leaking or if groundwater is infiltrating the system through a crack or seam, this condition should warrant a conditional pass which would require replacement or sealing of the tank if no other failure criteria are triggered. If the liquid level is above the outlet pipe and there is no outflow, then the outlet pipe may be clogged, or the distribution box may be surcharged. The inspector should try and determine the cause. If a surcharge in the tank is due to a broken or cracked pipe or other easily correctable circumstance, the system should merit a conditional pass if no other failure criteria are triggered.

Ensure sludge depth and thickness and record on the inspection form. Recommend pumping as part of the inspection if indicated by being within two inches of the outlet tee.

Check for evidence of backup (i.e. liquid level significantly higher than invert of outlet pipe) Outlet pipe will need to be examined as it enters distribution box to determine cause of backup. If backup is due to broken or obstructed pipe and no other failure criteria are triggered, the system may conditionally pass inspection.

Distribution Box

Expose and remove cover.

Determine if d-box is level and if flow is equal.

Check if there is evidence of solids carryover.

Check if static water level is at or higher than invert of outlet pipe. If the liquid level is above the outlet and there is no outflow, either the outlet pipes are clogged or the leaching area is surcharged and in failure. The inspector must determine the cause. The system may qualify for a conditional pass if the high liquid level is due to broken or obstructed pipes, broken distribution box or if the distribution box is uneven or settled.

It should be noted that if the hydraulic backup is due to a soil absorption system which is clogged, the system CAN NOT be made to pass by application to the soil absorption system of physical, chemical or biological agents or treatments. Such failures can generally only be corrected by upgrading or replacing the system. The Local Approving Authority should be consulted before any effort is made to repair or upgrade a failed soil absorption system.

Check the pump function if there is a dosing chamber instead of a distribution box. Similarly, if the system includes a siphon, its condition and functionality should be determined. If the pump is not functioning properly, the system may receive a conditional pass provided that the pump is repaired or replaced. If the siphon is not functioning and cleaning the siphon cannot correct the problem, the siphon should be replaced with a pump system (unless it is part of a recirculating sand filter system or other approved alternative technology). In either case, the entire system does NOT need to be upgraded unless other conditions exist which would warrant a complete upgrade.

Soil Absorption System

It is extremely important that the inspector locate the leaching system. However, excavation of the soil absorption system, once it is located, is typically NOT required. It may be appropriate to expose a portion of the soil absorption system (especially if the leaching system is a pit) to determine its condition if other indications of failure, such as evidence of breakout, ponding; sewage backup, condition of the distribution box, etc., suggest that a failure of the soil absorption system may have occurred. If the system is a leaching pit, it will generally make sense to open the pit and pump the liquid out of the pit to determine if groundwater infiltrates back into the pit.

Approximate layout should be determined by examining the topography and noting drain arrangement from access at distribution box. Location of the leaching system can often be accomplished by running a snake down the line(s) coming from the distribution box.

Determine condition of soil (e.g. clogged, hydrogen sulfide crust, etc.).

Determine level of ponding within disposal area (visual inspection).

Determine if leaching system is below the high groundwater elevation.

It should be noted that a soil absorption system that fails because it is clogged, CAN NOT be made to pass by application to the soil absorption system of physical, chemical or biological agents or treatments. Generally, these kinds of failures can only be corrected by upgrading or replacing the system. The Local Approving Authority

should be consulted before any effort is made to repair or upgrade a failed soil absorption system.

Groundwater Determination

Location of the bottom of the leaching facility compared to the HIGH groundwater elevation is the most common reason for the failure of systems inspected. It is also the most important reason that sewage is not adequately treated before it enters the groundwater table. For these reasons it is most important that the HIGH groundwater elevation be properly determined.

The phrase High groundwater elevation is used throughout this section because the groundwater elevation can vary significantly throughout the year, from year to year and in different types of soil.

High groundwater is defined in Title 5 (310 CMR 15.00) in the definition section (15.002) as follows:

a. Inland – The elevation above which in eight out of ten consecutive years the groundwater table does not rise. This elevation is commonly but not invariably reached during the months of December through April.
b. Coastal – For groundwater influenced by tidal action, the average of the monthly spring high tide groundwater level as recorded over the most recent consecutive 19 year period.

At the present time the most reliable method of determining the high groundwater elevation is to excavate a deep test hole and have it evaluated by a certified soil evaluator. This method is probably beyond a routine system inspection and should be used only in rare cases where there is disagreement among the inspector, the homeowner and the Board of Health and then only after consultation with the homeowner and the Board of Health.

Acceptable methods of estimating high groundwater elevation are as follows:

a. READ IT FROM PLANS:
If plans of the disposal system are available they should show the groundwater elevation on which the plan was based. Unfortunately, many older systems have no plans available and some have plans that merely recorded the groundwater elevation at the time of testing. This may or may not be the HIGH groundwater elevation. Be aware of the date these tests were performed, and how that fits into the water year.

b. OBSERVATION ON SITE:
Look for infiltration into the septic tank, cesspool or distribution box...even leaching pits, galley, or chambers if appropriate. Investigate the surrounding soil by the use of hand augers to determine groundwater elevation.

c. DETERMTNE IT FROM LOCAL CONDITIONS:
Observe the elevation of nearby wetlands; check for groundwater elevations on plans for systems located nearby; see if there is a sump pump in the building whose system you are inspecting; look for water marks on cellar walls. NEARBY is of course a subjective word. Be prepared to justify this use.

d. CHECK WITH THE LOCAL BOARD OF HEATLH:

Many towns maintain a network of groundwater monitoring wells that show relative groundwater elevations.

e. Check with the USDA:
The Unites States Department of Agriculture, Natural Resources Conservation Service often has maps, records and soil surveys, along with knowledgeable staff, which may be helpful in determining high groundwater elevation.

f. Check FEMA MAPS:

These flood plain maps, from the Federal Emergency Management Agency can be useful. They are often available from the local Conservation Commission.

g. CHECK, PUMPING RECORDS:
If the system you are inspecting is pumped each spring it is possible this is needed due to high groundwater.

h. CHECK WITH LOCAL DIGGERS:

Talk with the local water department and sewer department to learn if they have any first hand knowledge of water depths. Do the same with local excavators and installers, also, gas, telephone and electronic companies.

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i. Subscribe to USGS:

Subscribe to USGS groundwater records available at their website below.

j. KNOW THE CURRENT STATE OF GROUNDWATER

Groundwater elevations are recorded monthly by the USGS throughout New England, including over 100 wells within Massachusetts. Examination of the records from these wells shows water elevation changes varying from less than a few feet to more than seventeen feet in a given well. These records are available from:

http://ma.water.usgs.gov/water

Methods **k** through **n** below constitute more invasive means of determining high groundwater elevation. This guidance does not suggest that these methods are required in all cases. However, in instances where methods **a** through **h** have failed to provide

adequate information for determining high groundwater elevation, it may be necessary to employ these methods as described below.

k. Small diameter wellpoints can be driven to monitor groundwater elevation. Use appropriate adjustments to determine high groundwater elevation. This method may not be suitable for all soil conditions.

l. After observing effluent water levels, pump the leaching facility and monitor to see if groundwater rises to the bottom (may be more applicable to pits, chambers and galleries than trenches and fields).This approach should be taken with caution. If done during the dry season, the results do not guarantee that subsequent groundwater level rise will not inundate the leaching system. Best professional judgment must be used in order to determine at what point backflow into the system is due to groundwater infiltration or other factors. Also, in some soils, groundwater may take some time to stabilize. In these instances proper precautions must be taken to insure that the open area around the leaching facility is properly secured to prevent injury.

The system owner may choose to have the high groundwater elevation determined by the methods described in m and n below to confirm or disprove the results obtained by other methods or in place of the minimum requirements.

m. Drive an observation well with a powered auger, observe the groundwater elevation and make appropriate adjustments to determine high groundwater elevation. The maximum depth of the well should be twelve feet below grade at the lowest natural elevation on the site or, six feet below the bottom of the leaching facility.

n. Dig a deep observation hole (generally the last resort) and use appropriate adjustments to determine maximum high groundwater elevation. The maximum depth of the hole should be twelve feet below grade at the lowest natural elevation on the site or six feet below the bottom of the leaching facility.

Single Cesspools

Inspection of a single cesspool must provide sufficient information to determine if any of the failure criteria are triggered. Minimum requirements are:

Determine dimensions and materials of construction.

Measure liquid level distance to invert and evaluate compared to failure criteria.

Determine the distance below the bottom of the cesspool to high groundwater.

Note depth of sludge and scum, require pumping upon completion of initial inspection and observe infiltration of groundwater, if any.

Overflow of Cesspool Systems

Overflow cesspool systems consist of an initial cesspool that overflows to some type of leaching facility, either pits, fields or trenches. Generally, these systems are found in older facilities and have been installed bit by bit over the years, usually to "repair" failed cesspools. These are hybrid systems and do not fall under the definition of "cesspool" as found in Title 5, nor are they conforming Title 5 systems. As a result, these systems have to be inspected using criteria for both cesspools and conventional systems.

When inspecting an overflow cesspool system, the inspector should recognize that the first cesspool is nominally functioning as a septic tank. This means that this unit is likely to be fitted with inlet and outlet pipes and will not have the requisite free space of six inches or half a day's storage volume that is required for a single cesspool. Accordingly, in order to assess its suitability to function as a septic tank, the first cesspool should be evaluated based on septic tank criteria, except for water tightness. Thus the inspector must check for sludge and scum levels and depths, condition of inlet and outlet tees, and other septic tank criteria. The leaching system(s) or additional cesspool(s) should then be evaluated based on criteria for soil absorption systems.

Because the first cesspool is not watertight, it will leach some effluent and therefore must also be evaluated for setback distances for cesspools as defined in the failure criteria and held to these setbacks for determining failure. In addition, it must also be pumped after the evaluation of its function in order to determine if the bottom of the tank is above or below the maximum groundwater elevation, as is required for single cesspool systems.

In some instances, there may be more than two cesspools in series. Each cesspool that has an inlet and outlet pipe and overflows to another type of soil absorption system is to be evaluated as a septic tank as outlined above. Furthermore, they must be evaluated for cesspool setback criteria and pumped to determine if they are below the maximum groundwater elevation. The terminal leaching facility, whether a pit, trench field or additional cesspool (i. e. no outlet and/ or connection to any other leaching facility or cesspool) would be subject to the soil absorption system criteria only.

Setbacks

. Measure setbacks from drinking water supplies (soil absorption systems, cesspools and privies), surface waters (cesspools and privies only) arid bordering vegetated wetlands or salt marshes (cesspools and privies only). As previously indicated, encroachment on these setbacks may trigger failure or require further evaluation of the system by the Local Approving Authority. The System Inspector's job is only to gather information. It is the responsibility of the Local Approving Authority to determine an appropriate course of action in regard to upgrade requirements.

IT IS NOT THE SYSTEM INSPECTOR'S RESPONSIBILITY TO ENFORCE UPGRADE REQUIREMENTS OR TO MAKE ANY RECOMMENDATION OR DETERMINATION OF UPGRADE REQUIREMENTS.

Difficulty in Locating Components

If the inspector is unable to locate components of the disposal system, the following steps should be followed:

1. Pursuant to 310 CMR 15.302 all components prior to the leaching facility must be located.

2. If the system does not have a distribution box, then it is important to try and locate the leaching facility and inspect it directly in order to determine its condition.

3. If the high groundwater elevation is12 feet or more below than the lowest surface elevation on the lot, and there is no evidence of backup in the system, the leaching facility most likely is not below the high groundwater elevation. This condition, however, should not relieve the inspector from exercising due diligence in locating the leaching facility and inspecting its condition.

4. The Local Approving Authority should evaluate all “Not Determined” entries on the inspection form and have the final decision as to whether further investigation is required to adequately evaluate the system.